USAF Officer Contributes to Commercial Aviation Safety

Growing up, Kyle Smith's dream was to become a pilot in the U.S. Air Force. He's gotten partway there, graduating from the U.S. Air Force Academy in 2011. But the lieutenant's flying career is on hold for the time being so that he can work with the Air Force and the FAA on a project that has implications beyond the military: increasing the safety and efficiency of commercial aviation in this country.

Smith visited Headquarters last Friday to brief FAA management about his work on the development of the airborne collision avoidance system X (ACAS X), the proposed replacement for the traffic alert and collision avoidance system (TCAS) used by all major air carriers to avoid mid-air collisions.

On the same day, he received the Department of Transportation's RAISE Award, presented by Secretary Anthony Foxx. Each year, the DOT and FAA sponsor the RAISE Award (Recognizing Aviation and Aerospace Innovation in Science and Engineering) to encourage high school, college, and university students to think creatively and develop innovative solutions to aviation challenges.

Smith has been working at the Massachusetts Institute of Technology's Lincoln Laboratory on a specific mode of the ACAS X called ACAS Xo. This mode aims to provide additional safety during simultaneous or closely-spaced approaches to parallel runways.

The current TCAS system has passed its prime. Its design is not very flexible, and "tuning" the system to adapt to new flight scenarios is cumbersome. Based on 1990s-era operating systems, it also has proven too complex to continue. In addition, TCAS has a "nuisance alert" rate of 35 percent — that is, more than one in three alerts issued to pilots have proven false.

Lt. Smith briefs the FAA management board on ACAS Xo.

"It's a fine balance that you want between safety and efficiency," Smith explained. "At the same time, [you want] a system not overly sensitive, so pilots can trust it."

Simulations for how and when pilots should be alerted under different scenarios can take anywhere from a few hours to a few days. In order to quicken ACAS X, Smith decided to automate the process, or, as he put it: "Let the system learn from itself."

The results, he said, are "pretty pleasing." Automation has made ACAS X more flexible and easier to use than TCAS, especially important as the agency transitions to the Next Generation Air Transportation System, or NextGen. Successful implementation of ACAS X is expected to lead to fewer flight delays, lower fuel burn for aircraft, and lower costs for airlines — all while enhancing safety and reducing the nuisance alert rate to a mere 4 percent. ACAS X flight test prototypes were installed and tested on research aircraft at the FAA's William J. Hughes Technical Center.

John Hickey, deputy associate administrator for aviation safety, agrees. "The work you've done is really fabulous," he told Smith, who is working with the Aircraft Certification Service to establish regulatory standards for ACAS-X.

So does the Department of Transportation.

"We created the RAISE award to encourage students to think creatively and develop innovative solutions to aviation challenges," said Secretary Foxx. "With this year's winning submission, Lt. Smith has certainly done that, but I think he's done something more — he has shown that the science, technology, engineering, and math (STEM) academic communities in American schools are capable of producing practical solutions to real-world problems."

The FAA Center of Excellence (COE) program office has supported the Department of Transportation in its efforts to encourage students to pursue STEM careers and to think creatively about aviation challenges of today and tomorrow. Senior scientists from the FAA together with DOT and a panel of experts from various government agencies and other organizations reviewed many outstanding submissions prior to the secretary making his selection.

"We were delighted to finally meet Kyle and to have the opportunity to hear about his studies, his extraordinary research, his future plans, and to witness his enthusiasm, said Patricia Watts, director of the COE program, part of NextGen (ANG). "While we build infrastructure and buy new equipment to prepare for our future, the secretary's RAISE award and our FAA COE Program remind us how important it is to encourage and invest in our next generation of transportation professionals."

Smith, meantime, is learning to fly on an Air Force T-6 trainer. But his vision remains locked on the future: "I'll probably be flying with the ACAS X system in 10 to 15 years."

Lt. Smith was accompanied to Headquarters by Patricia Watts, Director of the FAA's COE Program, and Dennis Filler, director of the William J. Hughes Technical Center.